

Matthias Lehmann

PHD STUDENT

Cologne, Germany

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Research Interests

Generalist Agents, Deep Reinforcement Learning & Applications, AI for Mathematics, Open-Ended Learning, Human-in-the-Loop Systems

Education

Ph.D. in Business Administration

Since Oct. 2021

UNIVERSITY OF COLOGNE, GERMANY

- Research on machine learning applications
- Research projects:
 - Reinforcement learning for inventory optimization
 - Effects of large language models on learning
 - Generative AI in design processes
- Relevant coursework: Machine Learning, Introduction to Reinforcement Learning & Deep Learning, Statistical Inference, Econometrics
- Expected graduation date: October 2025

B.Sc. in Mathematics, Minor in Computer Science

Apr. 2021 - Dec. 2023

FERNUNIVERSITÄT HAGEN, GERMANY

- Average grade: 1.4

M.Sc. in International Management (CEMS)

Oct. 2018 - Jan. 2021

UNIVERSITY OF COLOGNE, GERMANY

- Average grade: 1.2, among the top 5% of graduates

B.Sc. in Business Administration

Oct. 2015 - Feb. 2018

UNIVERSITY OF COLOGNE, GERMANY

- Average grade: 1.2, among the top 1% of graduates

Publications

Lehmann, M. The Definitive Guide to Policy Gradients in Deep Reinforcement Learning: Theory, Algorithms and Implementations. 2024. <https://arxiv.org/abs/2401.13662>

Lehmann, M., Cornelius, P., Sting, J. AI Meets the Classroom: When Does ChatGPT Harm Learning? 2024. <https://arxiv.org/abs/2409.09047>.

Personal Research Projects

AlphaZero for Language Model Optimization: In this project, I propose using reinforcement learning with Monte Carlo tree search to finetune LLMs and I further target specific downstream applications.

Deep Reinforcement Learning with Rewards from Vision-Language Models: In this project, I train agents to fulfill arbitrary tasks formulated in natural language without hand-engineered reward functions. I use VLMs to ground the agent's environment in natural language and infer rewards as the basis for reinforcement learning training. https://github.com/Matt00n/rl_from_vlm_preferences

Experience

Meta

Jun. 2025 - Sep. 2025

MACHINE LEARNING ENGINEERING INTERN

London, UK

Google X

Mar. 2025 - May 2025

RESEARCH SCIENTIST INTERN

Mountain View, USA

- Core contributor on confidential machine learning projects
- Techniques employed include LLMs, reinforcement learning and multi-agent systems

University of Cologne

TEACHING ASSISTANT

- Supervision of bachelor's and master's theses
- Teaching graduate level courses: Python programming & machine learning course, supply chain research seminar
- Organizing committee of the international conference "CEMS Research Seminar on Supply Chain Management"

Oct. 2021 - May 2025

Cologne, Germany

FernUniversität Hagen

TEACHING ASSISTANT

- Data Science and Data Mining Course
- Evaluating and giving feedback for course assignments and exams

Oct. 2023 - Dec. 2024

Hagen, Germany

REWE

DATA SCIENCE INTERN

- Developed a transformer-based classification model to automatically allocate 100,000 products based on their names to product groups with human-expert level accuracy
- Developed a machine learning model to forecast sales as control group for field experiments
- Research project on improving product availability through deep learning

Apr. 2021 - Oct. 2021

Cologne, Germany

HKCF Corporate Finance

CONSULTANCY INTERN

- M&A and debt financing projects

Feb. 2018 - Apr. 2018

Cologne, Germany

Skills

Programming	Python, \LaTeX , SQL, Git
Frameworks	TensorFlow, Jax, GCP, NumPy, Pandas, HuggingFace
Languages	English, German

Honors & Awards

Since 2021	PhD Scholarship: 75,000 € , Cologne Graduate School in Management, Economics and Social Sciences
2015-2020	Scholarship: 15,000 € , "Deutschlandstipendium" for gifted students
2006-2014	5-time award winner , Mathematical Olympiad, state-wide round
2006-2014	8-time award winner , math competition "Mathematical Kangaroo"

Interests

- Tennis
- Chess
- Soccer
- Cooking